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Effect of dietary protein and protease supplementation on performance and gut health of broiler chicks

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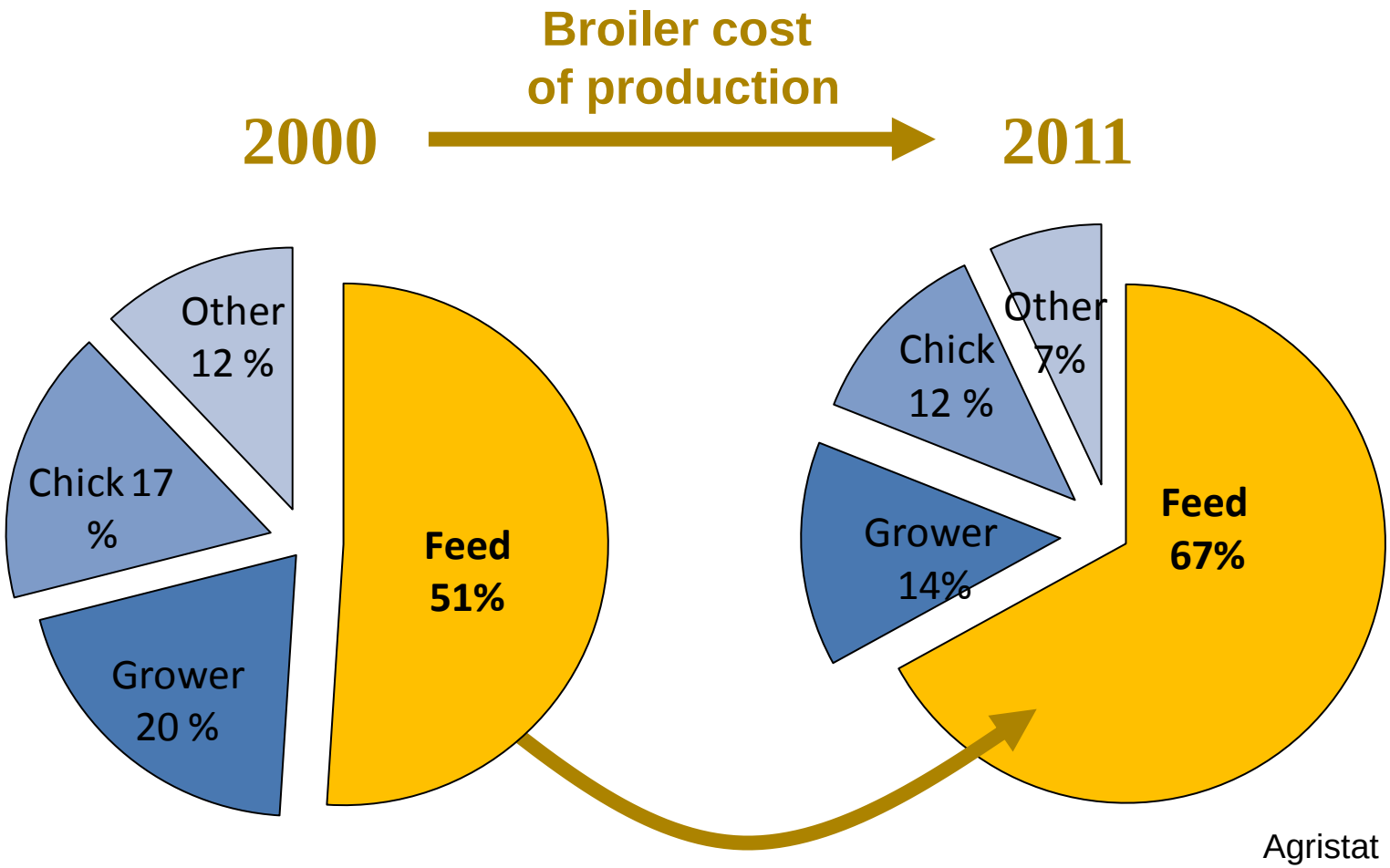
Novus international
→ in few words

- Global company specialized in feed additive
  - North American, Japanese capital Mitsui/ Nippon Soda
  - 1.3 billion turnover , 850 employees of witch 150 R&D
- Born in 1991 out of the scientific heritage of Monsanto
  - With 2 major products : methionine analogue / ethoxiquine
- Since developed into a multiproduct company
  - Methionine sources, antioxidants, enzymes, gut health, chelated trace elements, pigments,

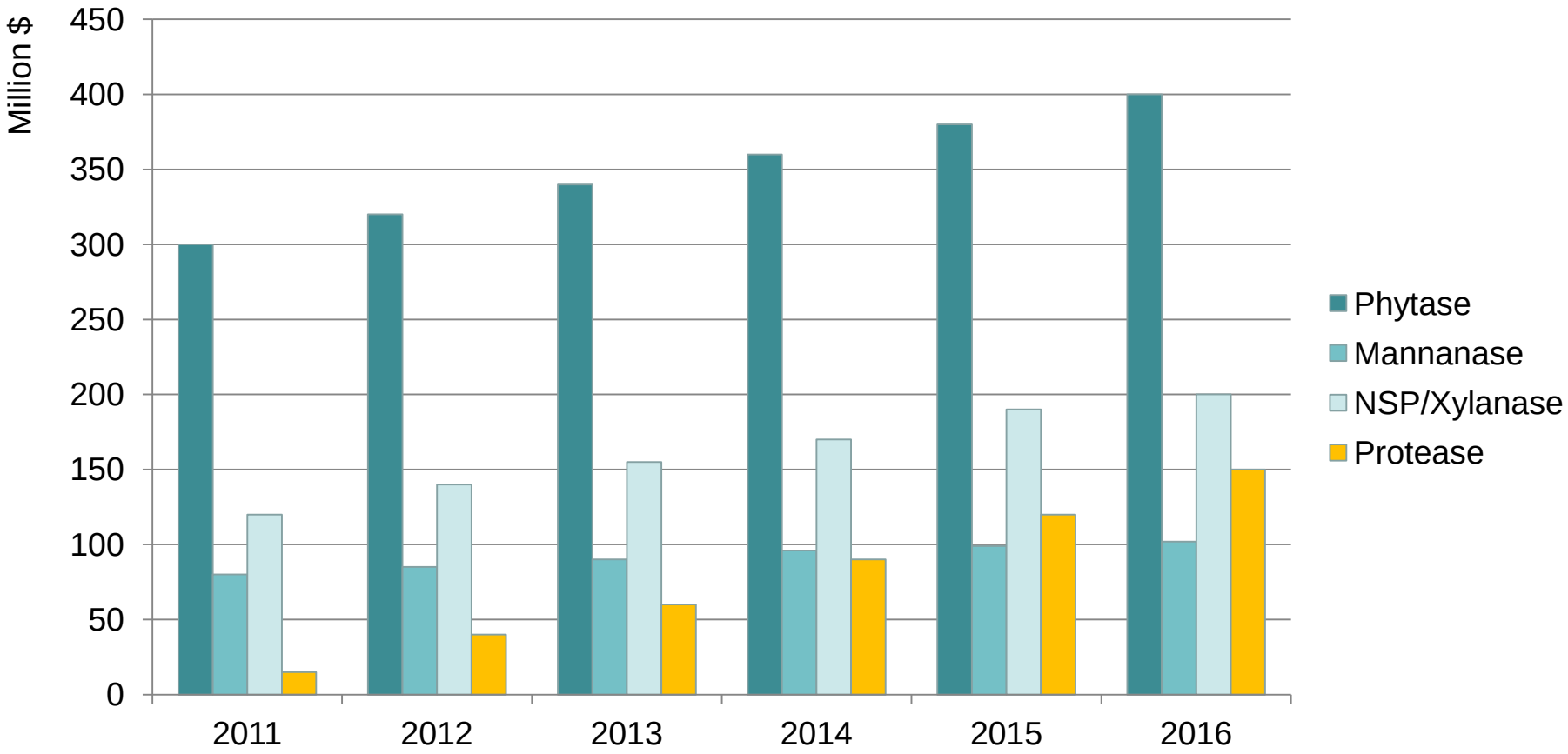
Continuous increase in feed protein cost

Feed now represents two thirds of broiler production costs



Agristat

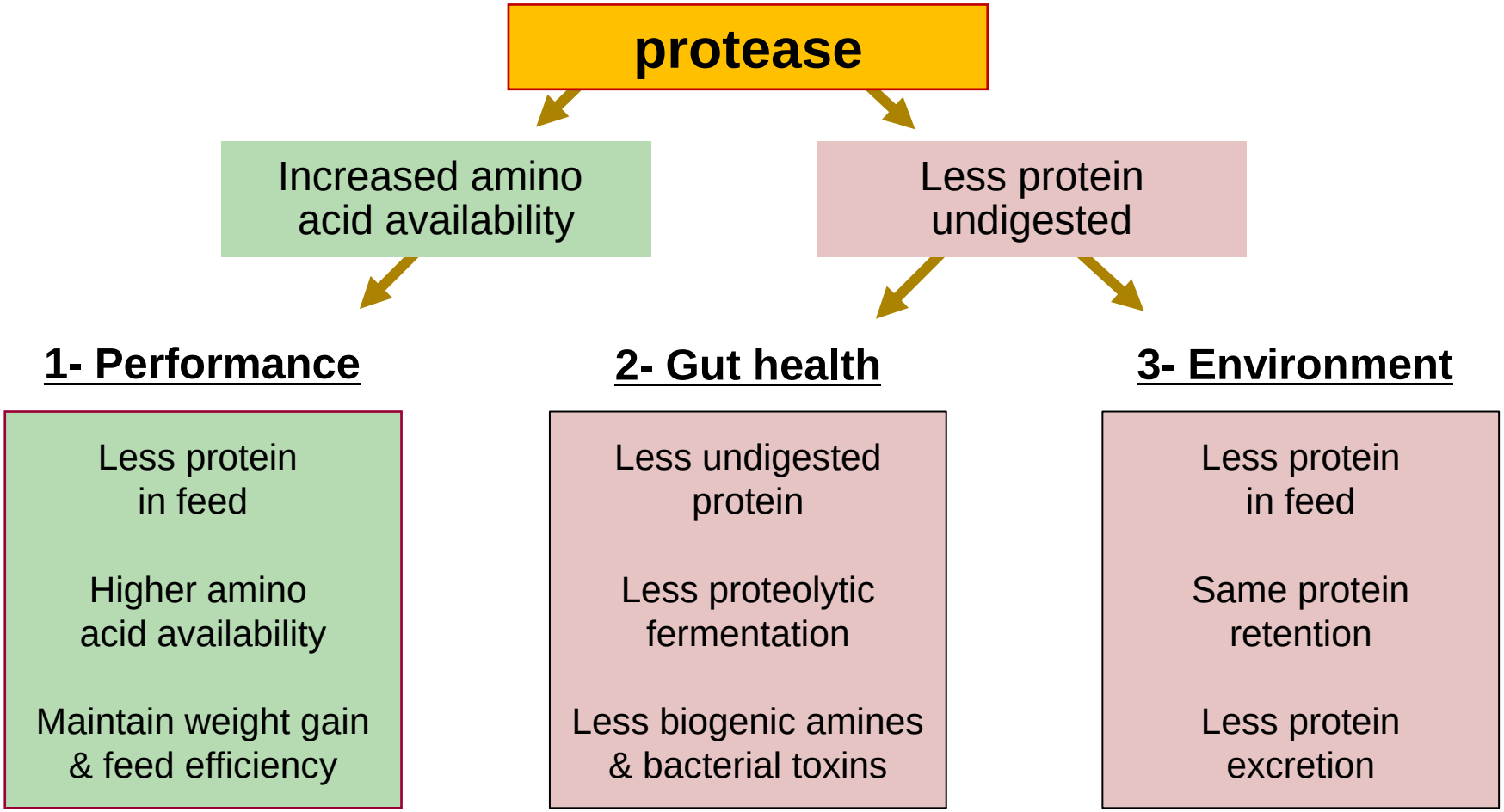
Increasing interest in feed enzymes
→ strong growth expected in protease use



Cibenza DP100
→ a protease for feed application

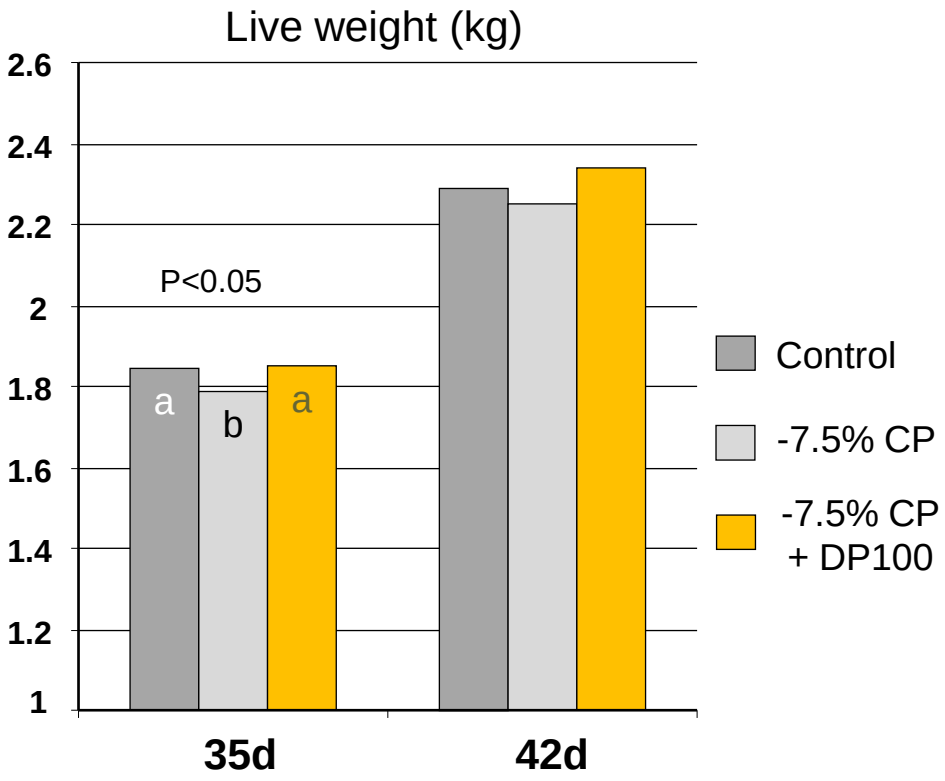
- Recently introduced in animal feed
- FDA and AAFCO approved
- Applying for registration in EU
- Heat stable from natural thermophillic *Bacillus licheniformis* PWD-1
- Broad spectrum activity: casein, collagen, keratin, elastin

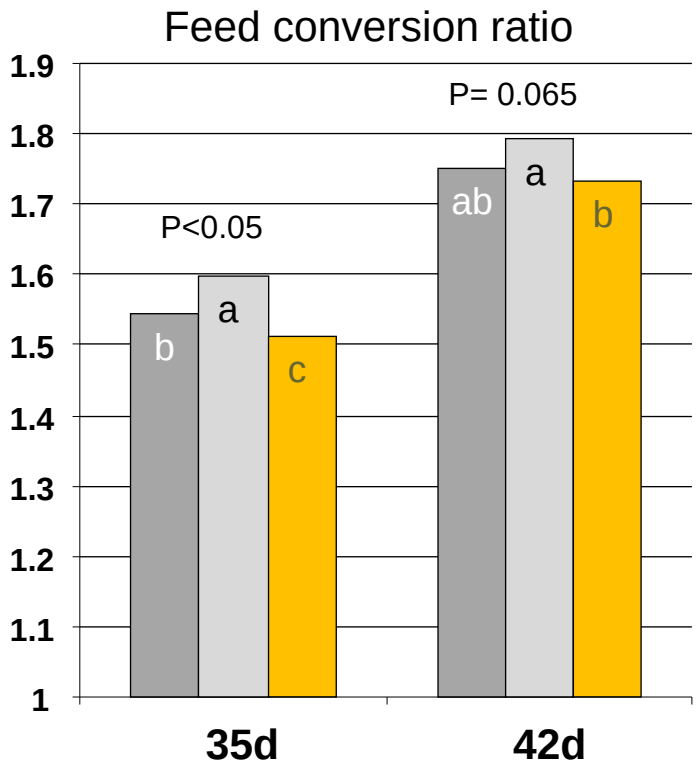
3 potential contributions of protease use in animal production



Reduction in feed protein → reduced feed cost

3 treatments x 8 pens x 45 broilers
protease DP100 at 0.5 kg/ton





Gutierrez - Southern Poultry, Atlanta 2011

ATA for “growth promotion”

Objective to reduce antibiotics used as GP

- Work with antibacterial
  - New additives mimicking in some way antibiotics
    → Generalized crossed resistance to expect ?

- Work on gut flora subtract *(flora nutrition)*
  - What ingredients? *(like corn vs wheat)*
  - What formulation? like low protein vs high protein
  - Digestibility aids like protease

Objective of study 1

To evaluate the effect of inclusion of protease at two dietary crude protein levels on broiler performance and gut health under stress conditions

Materials and methods

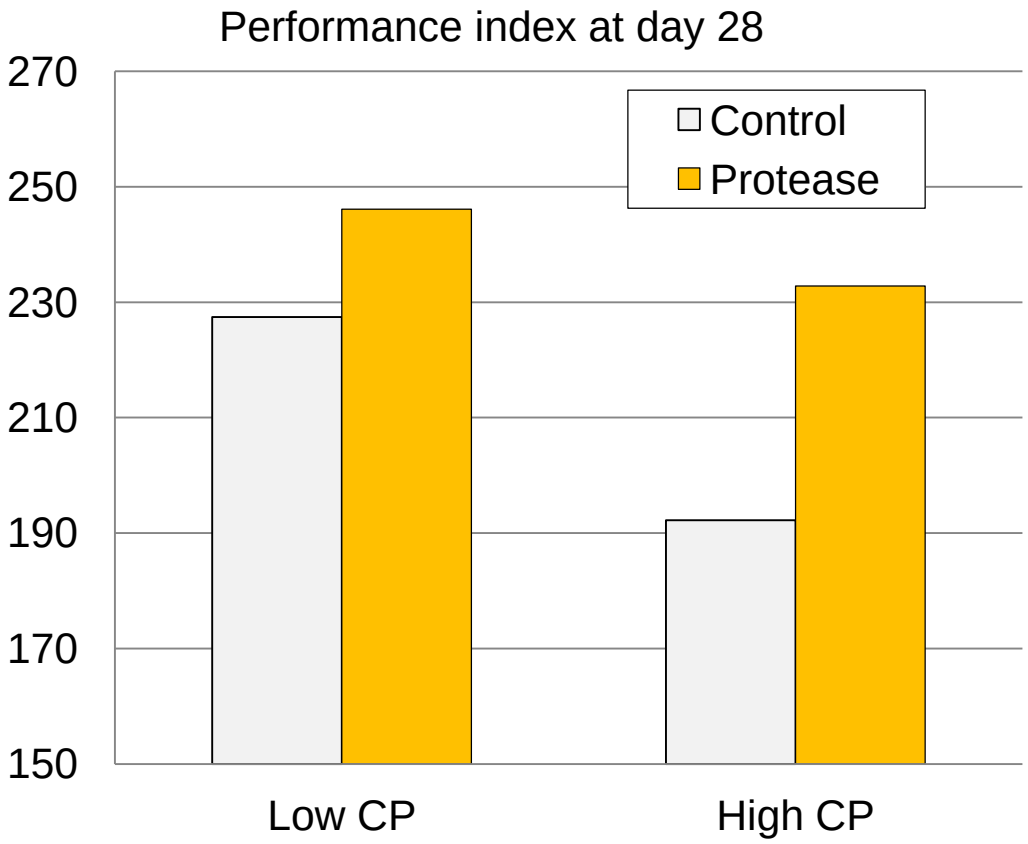
- Floor pen study, 288 male broilers, Ross 708
- 4 treatments : 9 replicate of 8 birds
  - 2x Protein : normal (22.1% CP) &high (30% CP by adding poultry meal)
  - 2x Protease (DP100) : with and without
- Stress challenge
  - Diet based on wheat and rye, no xylanase
  - Coccidia challenge on day 7 *(3x non attenuated vaccine)*
- Measurements
  - Performance at day 7, 14, 21, 28
  - Ileal *Clostridium perfringens* count at day 15
  - Gut histology at day 14
  - Serum α-1-acid glycoprotein level at day 22

Experimental diets

Ingredient	Normal protein	High protein
	%	%
Soybean meal (48%)	32.36	31.87
Wheat	25.00	25.00
Rye	20.00	20.00
Poultry meal	**0.00**	**14.36**
Corn	13.32	4.57
Soybean oil	4.32	3.29
Dicalcium phosphate	1.89	0.00
Limestone	1.33	0.00
Others	1.78	0.91
Total	100.00	100.00

Calc. nutrients	Normal protein	High protein
	%	%
ME (kcal/kg)	3000	3000
Crude protein (%)	**22.12**	**30**
d Lys,%	**1.21**	**1.39**
d TSAA,%	**0.89**	**0.89**
d Thr, %	**0.79**	**0.86**

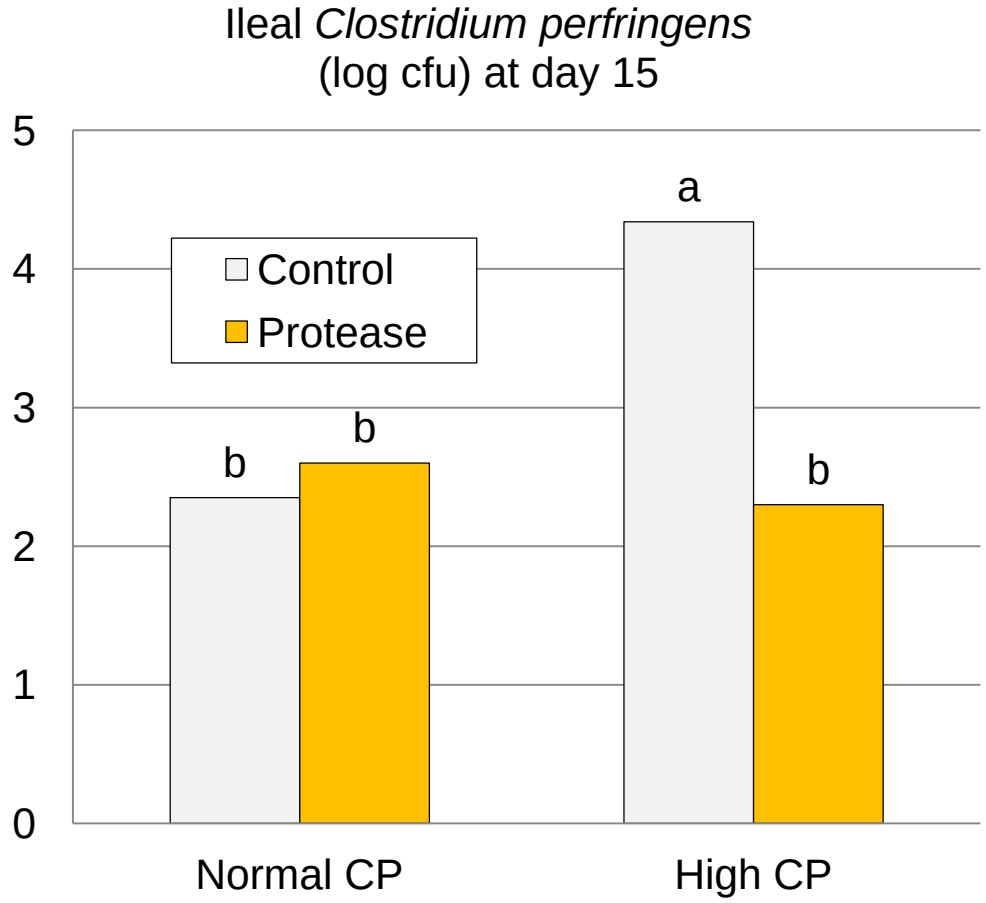
Effect of dietary CP and protease inclusion on performance index



Source of Variation	P-value
CP	0.260
Protease	0.171
CP x Protease	0.607

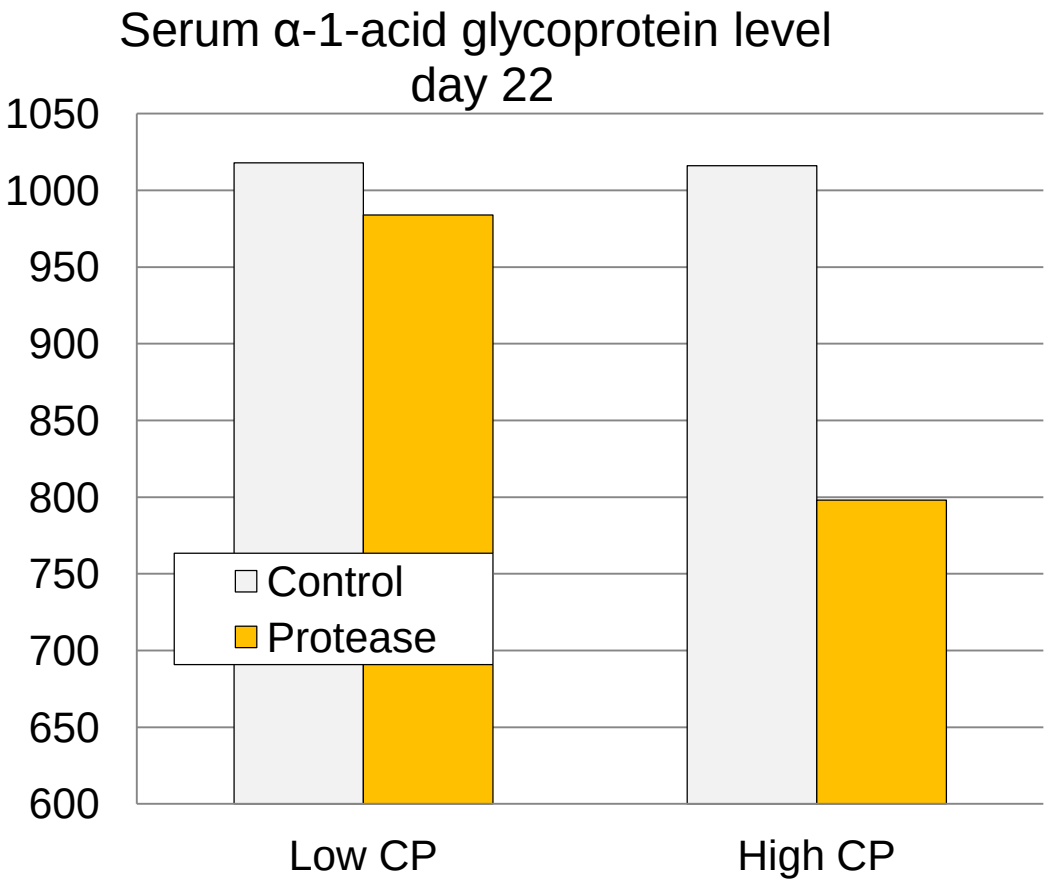
•Performance Index = ((Livability*((Body Weight*1000) /Day of study)*10) / (Feed to Gain corrected for dead bird weight)).

Effect of dietary CP and protease inclusion on ileal *Clostridium perfringens*



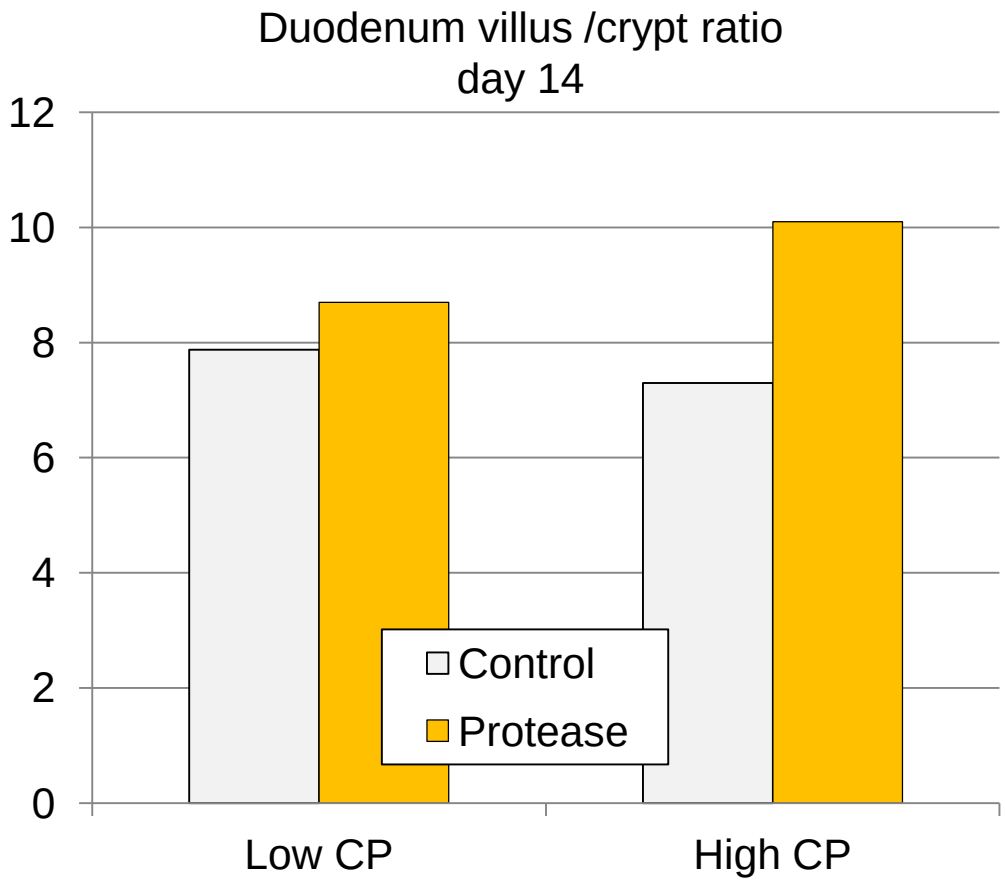
Source of Variation	P-value
CP	0.128
Protease	0.107
CP x Protease	0.043

Effect of dietary CP and protease inclusion on a liver acute phase protein production



Source of variation	P-value
CP	0.717
Protease	0.022
CP x Protease	0.738

Effect of dietary CP and protease inclusion on gut morphology (villus/crypt ratio)



Source of variation	P-value
CP	0.821
Protease	0.054
CP x Protease	0.295

Conclusions study 1

Excess dietary protein together with a coccidial challenge resulted in

- Intestinal wall erosion
- Ileal dysbacteriosis
- Increased serum acute phase proteins

Inclusion of DP 100 restored performance to the levels shown by the low protein group

Objectives of study 2

To evaluate the effect of inclusion of protease at two dietary crude protein levels on broiler performance under stress conditions based on bird density

Materials and methods

- Floor pen study, 1104 male broilers Ross 708
- 6 treatments with 8 replicates of 21 or 25 birds /pen
  - Normal protein, low protein , low protein + protease (DP100)
  - No stress, stress
- Stress challenge
  - Normal conditions: 21 bird/pen (14.3/m²) , no feed outage
  - Stress conditions: 25 birds/pen (17.2/m²), 8 hr feed outage at d0 and d14
- Measurements
  - 14 and 27
  - BW, FI, FCR, mortality

Composition of starter diet

Crumble - 0 to14 days

Ingredients	normal protein	low protein
Corn	54.04	58.19
Soybean meal, 48%	34.96	31.29
DDGS	5.00	5.00
Soybean oil	2.32	1.75
L-LYSINE HCL 78%	0.18	0.20
MHA - 84%	0.24	0.22
Threonine	0.08	0.07
Phytase	0.05	0.05
Protease	0.00	0.05
Total	100	100

Nutrient	normal protein	low protein
ME, kcal/kg	3040	3040
Crude protein, %	22.50	21.10
Dig Lys, %	1.19	1.11
Dig TSAA, %	0.89	0.83
Dig Thr, %	0.78	0.72

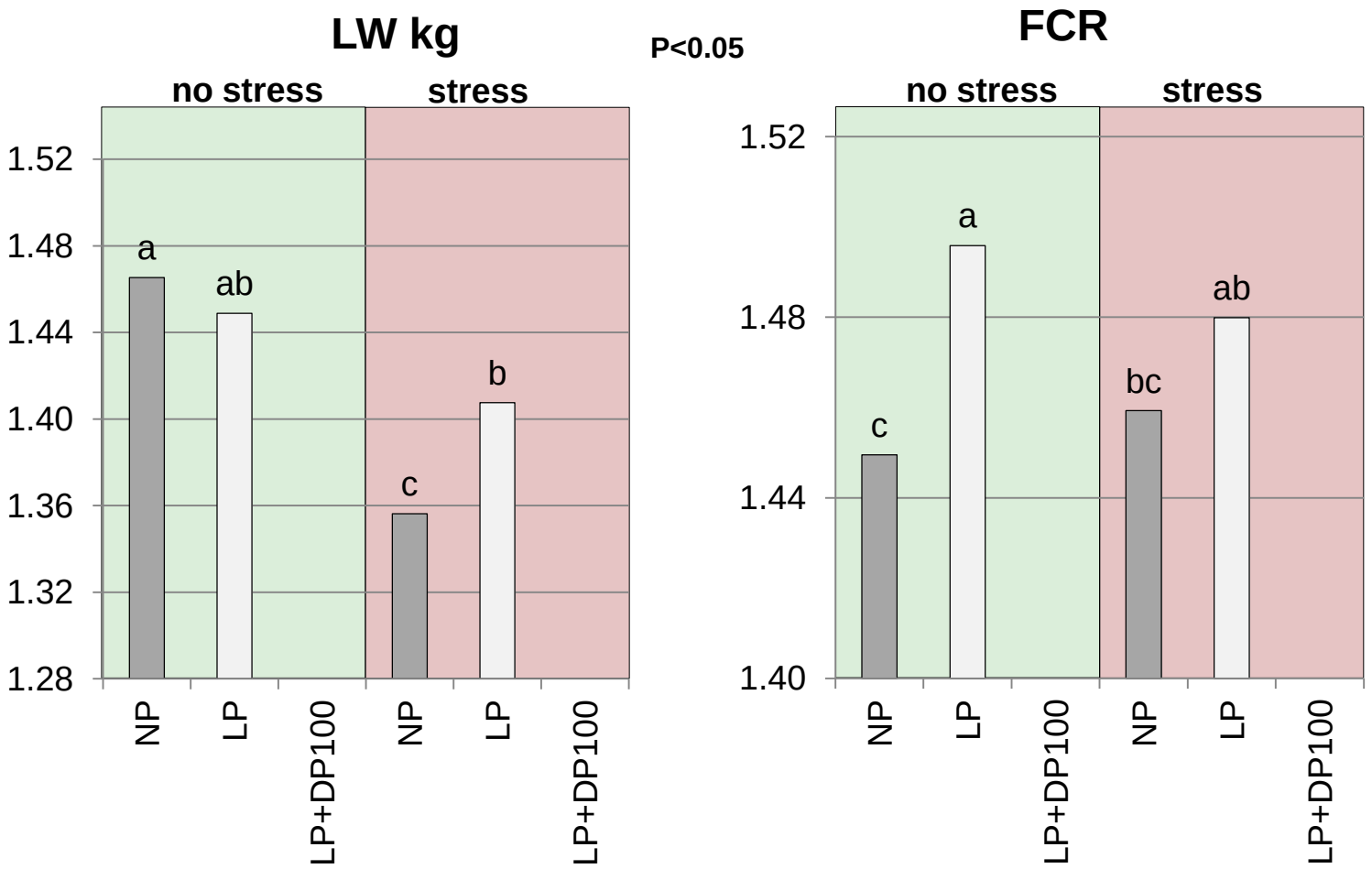
Composition of grower diet

Pellet - 14 to 27 days

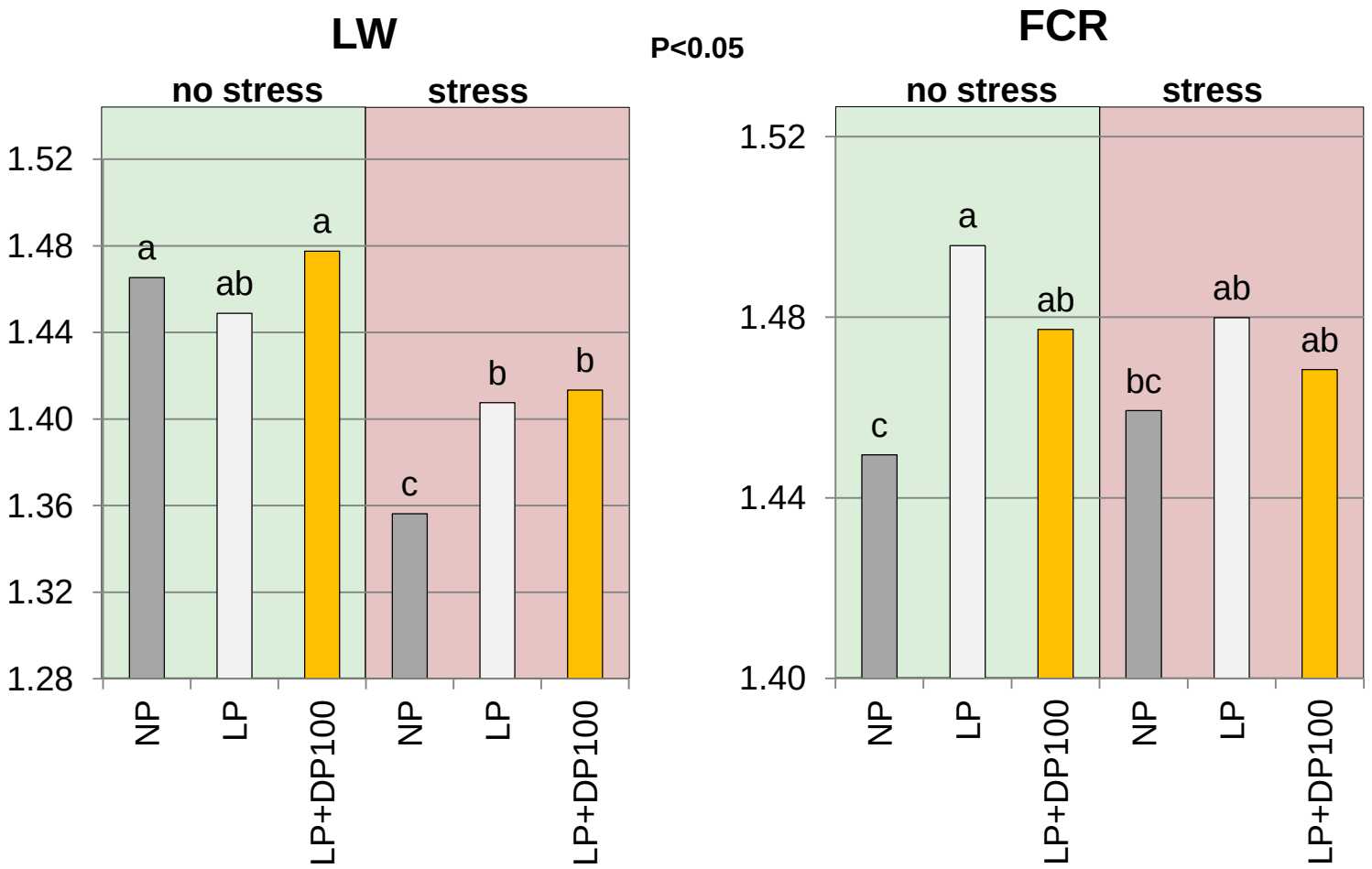
Ingredients	normal protein	low protein
Corn	59.11	63.23
Soybean meal, 48%	29.94	26.27
DDGS	5.00	5.00
Soybean oil	2.58	2.01
L-LYSINE HCL 78%	0.18	0.21
MHA - 84%	0.21	0.19
Threonine	0.06	0.06
Phytase	0.05	0.05
Protease/corn starch	0.00	0.05
Total	100	100

Nutrient	normal protein	low protein
ME, kcal/kg	3120	3120
Crude protein, %	20.50	19.10
Dig Lys, %	1.07	0.99
Dig TSAA, %	0.82	0.76
Dig Thr, %	0.70	0.64

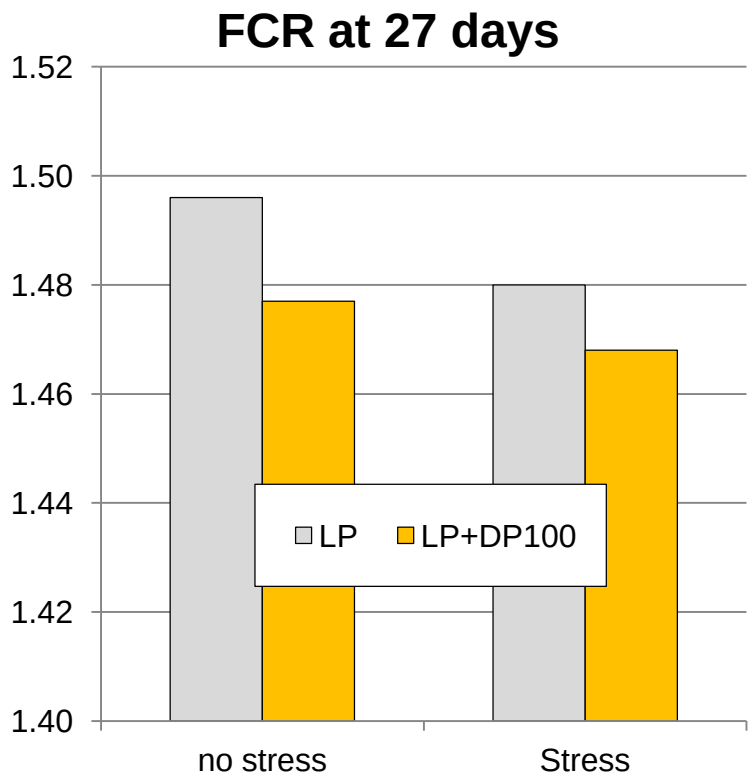
Effect of protein level at 27 days



… and effect of protease



Effect of the protease in the low protein diets on feed conversion ratio



Source of Variation	P value	SEM
Stress	0.1455	0.006
Protease	0.0813	0.006
Str x Pr	0.6694	0.008

Conclusions Study 2

- Stressed birds had a better growth on the low protein diets
- Low protein diet worsen feed efficiency in non stressed birds
- Inclusion of the protease resulted in improvement in feed efficiency in birds fed low protein diets in both the stressed and non-stressed groups ($p<0.1$)

Overall conclusions

- A range of stress factors were shown to have an effect on bird performance
  - High protein diets together with a coccidial challenge resulted in dysbacteriosis and changes in gut structure
  - Increased bird density reduced performance although this effect was less apparent in birds on a low protein diet
- Inclusion of the protease Cibenza DP100
  - reduced the dysbacteriosis and improved gut morphology in birds fed high protein diets
  - In low protein diets, improved feed efficiency in both control and stressed birds

Thank you!